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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR		ATTORNEY DOCKET NO.
09/607,604	06/30/00	ALLISON	R	PD-00W014

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EXAMINER	
CATHEY,D	
ART UNIT	**PAPER NUMBER**
2817	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner of Patents and Trademarks

Office Action Summary	Application No. 09/607,604	Applicant(s) ALLISON ET AL.	
	Examiner Damian E. Cathey	Art Unit 2817	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____ .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-24* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 June 2000* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Drawings

1. On page 8 and 9 of the Specification, the RF ports are referred to as 102 and 104 whereas on the drawings in Fig. 4A, they are labeled 104 and 106. Furthermore, in the detailed description of the preferred embodiments on page 11, line 1, paths 155 and 157, which are referred to, are not labeled on Fig. 6B. Appropriate correction is required.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

3. Claims 1, 2, 5-9, 13-17, and 21-24 are rejected under 35 U.S.C. 102(e) as being anticipated by Hong U.S. Patent No. 6,281,838 B1.

4. In reference to claim 1, Hong discloses an electrically scanned array, 10, comprising a linear array of radiating elements, 12, and an array of phase shifters, 14, coupled to the radiating elements (See Hong Fig. 1). Hong further discloses an RF

manifold including a plurality of phase shifter ports coupled to a corresponding phase shifter RF port and an RF port; and inherent beam steering means (See Hong Col. 4, line 3). Hong further discloses each phase shifter includes a plurality of MEM switches, 36a-f, 46a-f, 52a-f, and 56a-f, responsive to control signals to select one of a discrete number of phase shift settings for each phase shifter (See Hong Col. 3, line 56).

5. Referring to claim 2, Hong discloses phase shifters including switched line phase shifters (See Hong Col. 2, line 35) including a reference signal path, 36b, 46b, 52b, and 56b, and phase shift paths 36a, 46a, 52a, 56a, and 36c, 46c, 52c, and 56c (See Hong Fig. 3), each path having a respective electrical length selected to provide a corresponding phase shift value (See Hong Col. 4, line 8) and the plurality of MEM switches configured to select the reference path or one of the phase shift paths (See Hong Col. 4 line 24).

6. In reference to claim 5, Hong discloses an array of phase shifters, 30, incorporating a series of single pole single throw MEM switches, 36a, 36b, and 36c, and an armature for opening and closing the RF signal path through the switch and a control signal paths, 36a-c, and wherein the control signals are isolated from the RF signal path.

7. Referring to claim 6, Hong (Fig. 3) discloses an RF phase shifter circuit (See Hong Col. 2, line 4) with first and second RF ports, 40 and 12, comprising a plurality of single pole single throw MEM switches, 36a-f, 46a-f, 52a-f, and 56a-e, (See Hong Fig. 3), responsive to control signals and arranged to select one of a plurality of phase shift values and connected to provide a single pole multiple throw or multiple pole multiple

throw switch function. The three switches 36a, 36b, and 36c shown in Fig. 3 of Hong function equivalently as a single pole multiple throw switch (SP3T).

8. In reference to claim 7, Hong discloses a phase shift circuit that is a switched line phase shift circuit (See Hong Col. 2, line 35) including a reference signal path, 36b, 46b, 52b, and 56b, and phase shift paths 36a, 46a, 52a, 56a, and 36c, 46c, 52c, and 56c (See Hong Fig. 3), and a plurality of MEM switches configured to select the reference path or one of the phase shift paths in response to phase shift control signals (See Hong Col. 4 line 24).

9. Referring to claim 8 and 9, Hong shows that switch 36b selects the reference path.

10. Referring to claims 14 and 23, while Hong doesn't explicitly recite metal-metal contact RF MEMs series switches, by virtue of the disclosed fabrication process of the MEM switches to be used by Hong inherently provides for metal-metal contact RF MEMs series switches (See Hong Col. 6, lines 19-57).

11. In reference to claim 15, Hong discloses a multi-section RF phase shifter circuit, 30, having a plurality of phase shift sections (See Hong, Col. 2, line 44) connected in series to provide selectable phase shifts to RF signals passed through the circuit. Hong further discloses that each phase shift section includes a switch circuit, 36, 46, 52, and 56, comprising a plurality of MEM switches responsive to control signals and arranged to select one of a plurality of phase shift values and connected to provide a single pole multiple throw or multiple pole multiple throw switch function.

12. Referring to claim 16, Hong discloses a circuit wherein at least one phase shift section is a switched line phase shift circuit (See Hong Col. 2, line 35) including a reference signal path, 36b, 46b, 52b, and 56b, and phase shift paths 36a, 46a, 52a, 56a, and 36c, 46c, 52c, and 56c (See Hong Fig. 3), and a plurality of MEM switches configured to select the reference path or one of the phase shift paths in response to phase shift control signals (See Hong Col. 4 line 24).

13. In reference to claim 17, Hong shows that switch 36b selects the reference path.

14. Referring to claim 22, Hong discloses an RF switch circuit (See Hong Col. 3, line 4) configured to provide a single pole multiple throw or multiple pole multiple throw switch function to RF signals, incorporating a plurality of MEM RF switches, 36a-f, 46a-f, 52a-f, and 56a-f, each responsive to DC control signals to control the open/closed state of the switch (See Hong Col. 7, line 3), each switch having first and second RF ports and at least the first and second single pole single throw switches have first RF ports connected at a common junction (See Hong Fig. 3).

15. In reference to claim 24, Hong discloses a switch circuit, 30, wherein a single pole multiple throw function is provided to an RF signal and the number of throws is 3 (SP3T), which includes 3 single pole single throw switches connected at a common junction.

Claim R j ctions - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

17. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

18. Claims 3, 10, 13, 18, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong U.S. Patent No. 6,281,838.

19. Referring to claims 3, 10, and 18, Hong discloses a phased array antenna, 10, utilizing electronic beam steering and having a plurality of radiating elements, 12, each of which has its own phase shifter, 14. Hong further discloses that an input line, 16, is coupled to each phase shifter, which imparts a respective predetermined phase shift to the transmission signal as it passes through that phase shifter. The phase-shifted

signals are then coupled to respective radiating elements, 12, for transmission. Hong further discloses that various types of phase shifters, 14, have been developed, including switched-line phase shifters, reflection-line phase shifters, and loaded-line phase shifters (See Hong Col. 1, line 48).

20. Claims 3, 10, and 18 state that an array of phase shifters includes reflection phase shifters, wherein MEM switches are connected to select one of a plurality of reactance values determining a phase shift value, which is not stated in Hong.

21. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the phased array antenna, 10, disclosed by Hong to include reflection phase shifters, 14, as suggested by Hong.

22. The above substitution would have been considered obvious in view of explicit suggestion of Hong incorporating switched-line, reflection-line, or loaded-line phase shifters in the phased array antenna, 10 of Hong (See Hong Fig. 1). Obviously, any of such devices would have included MEM switches since no other means of switching are provided by Hong and as a consequence of the modification, MEM switches would need to be used.

23. In reference to claims 13 and 21, Hong discloses a phase shifting device incorporating the use of multiple pole multiple throw switches, 36a-f, 46a-f, 52a-f, and 56a-f, for a switched-line antenna (See Hong Fig. 3). Hong further discloses that various types of phase shifters, 14, have been developed, including switched-line phase shifters, reflection-line phase shifters, and loaded-line phase shifters (See Hong Col. 1, line 48).

24. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the phased array antenna, 10, of Hong to include reflection phase shifters, 14, incorporating the multiple pole multiple throw switches as taught by Hong.

25. The above modification would have been obvious in view of implicit suggestions of Hong that various types of phase shifters have been developed, including switched-line phase shifters, reflection-line phase shifters, and loaded-line phase shifters that may incorporate the use of MEM switches.

26. Claims 4, 11, 12, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong U.S. Patent No. 6,281,838 in view of Nakahara U.S. Patent No. 5,379,007.

27. Hong discloses a phased array antenna, 10, utilizing electronic beam steering and having a plurality of radiating elements, 12, each of which has its own phase shifter, 14. Hong further discloses that an input line, 16, is coupled to each phase shifter, which imparts a respective predetermined phase shift to the transmission signal as it passes through that phase shifter. The phase-shifted signals are then coupled to respective radiating elements, 12, for transmission. Hong further discloses that various types of phase shifters, 14, have been developed, including switched-line phase shifters, reflection-line phase shifters, and loaded-line phase shifters (See Hong Col. 1, line 48), however, Hong does not explicitly disclose a reflection-line phase shifter circuit.

28. Claims 4, 11, and 19 state that each reflection phase shifter in the array of phase shifters comprise a coupler device having first and second RF I/O ports, and in phase

quadrature ports, and first and second reactance circuits respectively coupled to the in-phase and quadrature ports by first and second MEM switch circuits. Claims 12 and 20 state that the first and second reactance switch circuits are arranged to select more than one of a plurality of selectable reactance values by using a plurality of MEM switches which is not stated in Hong.

29. Nakahara discloses a phase shifter device, 700, wherein each of the reflection phase shifters, 100 and 300, comprise a coupler device, 3, having first and second RF I/O ports, and in phase quadrature ports, and first and second reactance circuits respectively coupled to the in-phase and quadrature ports by first and second FET switch circuits, 4a, 6a, 7a, 9 and 4b, 6b, 7b, 9. Nakahara further discloses that each resonant circuit comprises an FET, 7a and 7b, and an inductor, 9, connected between source and drain electrodes of the FETs, 7a and 7b. As a result, two different phase shift values are attained in one reflection phase shifter resulting in a two bit phase shifter smaller than the conventional two bit phase shifter in which two reflection phase shifters are connected in series.

30. Hong discloses that the switching network disclosed in the phased array antenna, 10, can be implemented using PIN diode switches or FET switches in the phase shifters, 14. (See Hong Col. 6, line 5).

31. Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the phased array antenna, 10, of Hong (See Hong Fig. 1) to incorporate the reflection circuit of Nakahara and to have

substituted the FET switches, 7a and 7b, of Nakahara with MEM switches as taught by Hong.

32. The above substitution would have been obvious because it would have been considered both a substitution of art recognized equivalence in view of recognition that FETs, MEM switches and PIN diodes are interchangeable, and an advantageous means of providing switching capabilities as taught by Hong, as well as an advantageous means of attaining two different phase shift values in one reflection phase shifter resulting in a two bit phase shifter smaller than the conventional two bit phase shifter in which two reflection phase shifters are connected in series.

Conclusion

33. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. Patent No. 5,128,639 to Ueda et al. describes reflection phase shifter and shifter circuits in series using FETs.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Damian E. Cathey whose telephone number is 703-308-4909. The examiner can normally be reached on 7:00 - 3:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on 703-308-4909. The fax phone numbers for

the organization where this application or proceeding is assigned are 703-305-0142 for regular communications and 703-305-0142 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Justin P. Bettendorf
Primary Examiner
Art Unit 2817

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October 9, 2001

Justin P. Bettendorf
Primary Examiner
Art Unit 2817